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## BUREAU OF MINES MINERALS YEARBOOK

# Sodium Compounds

UNITED STATES DEPARTMENT OF THE INTERIOR

**The statistical data in this volume represents the most comprehensive, verified, domestic and international coverage for 1987 at the time the volume went to press. More recent information can be found in the monthly Sodium Compounds Mineral Industry Surveys obtainable from Publications Distribution, Bureau of Mines, Box 18070, Cochrans Mill Road, Pittsburgh, PA 15236.**

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This publication is a chapter from the current Bureau of Mines Minerals Yearbook, comprising *Volume I, Metals and Minerals; Volume II, Area Reports: Domestic; Volume III, Area Reports: International.* The separate volumes of the Yearbook are sold by the Superintendent of Documents, Washington, D.C. 20402.

# Sodium Compounds

By Dennis S. Kostick[1]

**U.S. soda ash production rebounded because of an increase in domestic and export soda ash demand. These increases began in the third quarter as market conditions improved in the chemical, fiberglass, and flue gas desulfurization sectors. Exports to Asia remained strong, primarily to China, which accounted for about one-fourth of total U.S. exports. Production of natural and synthetic sodium sulfate was unchanged; however, exports increased as imports for consumption and ending inventories decreased, indicating stagnant domestic growth in consumption.**

**Table 1.—Salient sodium compound statistics**

(Thousand short tons and thousand dollars)

| | Soda ash | | Sodium sulfate[2] | |
|---|---|---|---|---|
| | 1986 | 1987 | 1986 | 1987 |
| United States: | | | | |
| Production | [r]8,438 | [e]8,991 | [r]812 | 805 |
| Value[3] | [r]$588,517 | [e]$598,685 | [r]$69,923 | $69,709 |
| Exports | [r]2,049 | [r]2,224 | 111 | 122 |
| Value | [r]$241,238 | [r]$253,200 | $10,186 | $10,554 |
| Imports for consumption: | 106 | 140 | 139 | 136 |
| Value | $15,825 | $17,334 | $10,329 | $10,363 |
| Stocks, Dec. 31: Producers' | [r]294 | 259 | [r]72 | [e]65 |
| Consumption, apparent | 6,080 | 6,853 | 834 | 838 |
| World: Production | [e]31,179 | [e]32,395 | [e]4,974 | [e]5,007 |

[e]Estimated. [p]Preliminary. [r]Revised.

[1]Includes natural and synthetic except where noted. Total production data for sodium sulfate obtained from the Bureau of the Census.

[2]Includes some soda liquors, converted to soda ash equivalent.

[3]The value for soda ash includes synthetic soda ash, for 1986 only. The value for synthetic sodium sulfate is based upon the average value for natural sodium sulfate.

[4]Export data were adjusted by the Bureau of Mines to reconcile data discrepancies among the Bureau of the Census, the American Natural Soda Ash Corp., and Statistics Canada.

[5]Includes synthetic soda ash.

[6]Natural only.

**Domestic Data Coverage.**—Domestic production data for soda ash and natural sodium sulfate are developed by the Bureau of Mines from monthly and annual voluntary surveys of U.S. operations. Of the seven soda ash operations and four natural sodium sulfate operations to which a survey request was sent, all responded, representing 100% of the total production data shown in table 1.

## DOMESTIC PRODUCTION

**Soda Ash.**—The domestic soda ash industry operated at 84% of total nameplate capacity as production rose more than 5% compared with the previous year. The increase in output was necessary to meet the rise in demand created by favorable market conditions.

The 51% share of Stauffer Chemical Co. of Wyoming was sold to Imperial Chemical Industries (ICI) and later to Rhône-Poulenc S.A., both European synthetic soda ash producers. Including other French and Australian investments in Texasgulf Chemical Co. and General Chemical Co., respectively, the total foreign ownership in the U.S. soda ash industry represented about 30% of nameplate capacity.

T. G. Soda Ash Inc. obtained environmental permits from the Wyoming Department of Environmental Quality to increase capacity to 1.3 million tons; however, an operational capacity of 1.1 million tons was still being maintained by the plant.

Denison Resources NL, an Australian mineral company, signed a letter of intent near yearend to acquire the Owens Lake sodium carbonate deposit in California from Lake Minerals Corp., a subsidiary of Cominco American Incorporated. Denison planned to construct an $85 million facility to produce 500,000 tons of soda ash annually and a similar amount of sodium sulfate.[1]

**Sodium Sulfate.**—Production of natural sodium sulfate decreased slightly, but recovery of synthetic sodium sulfate increased slightly. At midyear, the natural sodium sulfate industry operated at 72% of total nameplate capacity. Based on second-half production data, the industry operated at about 90% of total nameplate capacity, which was reduced by 70,000 tons to 440,000 tons per year with the temporary closure of Ozark-Mahoning Co.'s Brownfield, TX, facility. Extensive rainfall that diluted the brinefield, which caused production problems, was the reason for the action.

The synthetic sodium sulfate industry operated at about 81% of total annual nameplate capacity, which was 524,000 tons. J. M. Huber Co., Etowah, TN, increased synthetic sodium sulfate capacity by 5,000 tons per year because the company expanded its silica pigment operation.

**Table 2.—Producers of soda ash and natural sodium sulfate in 1987**

| Product and company | Plant nameplate capacity (thousand short tons) | Plant location | Source of sodium |
|---|---|---|---|
| Soda ash, natural: | | | |
| FMC Wyoming Corp | 2,850 | Green River, WY. | Underground trona. |
| General Chemical Corp.[1] | 2,200 | do | Do. |
| Kerr-McGee Chemical Corp | 1,300 | Argus, CA | Dry lake brine. |
| Do[2] | 150 | Westend, CA | Do. |
| Stauffer Chemical Co. of Wyoming[3] | 1,980 | Green River, WY. | Underground trona. |
| Tenneco Minerals Co | 1,000 | do | Do. |
| T. G. Soda Ash Inc.[4] | 1,100 | Granger, WY | Do. |
| Total | 10,569 | | |
| Sodium sulfate, natural: | | | |
| Great Salt Lake Minerals & Chemicals Corp.[5] | 50 | Ogden, UT | Salt lake brine. |
| Kerr-McGee Chemical Corp | 240 | Westend, CA | Dry lake brine. |
| Ozark-Mahoning Co.[6] | 70 | Brownfield, TX. | Subterranean brine. |
| Do | 130 | Seagraves, TX | Do. |
| Total | [6]510 | | |

[1]General Chemical Corp. formed a joint venture with Australian Consolidated Industries International, which acquired 49% of the soda ash operation.
[2]Scheduled to terminate soda ash production in Jan. 1988.
[3]Bought by Rhône-Poulenc S.A. in Sept. 1987.
[4]Owned by Société Nationale Elf Aquitaine.
[5]Placed on standby Aug. 1987.
[6]Capacity reduced to 440,000 tons effective Aug. 1987 because Ozark's Brownfield plant was placed on standby.

Table 3.—Synthetic and natural sodium sulfate[1] produced in the United States

(Thousand short tons and thousand dollars)

| Year | Synthetic and natural[2] (quantity) | | | Natural | |
|---|---|---|---|---|---|
| | Lower purity[3] (95% or less) | High purity | Value | Quantity | Value |
| 1983 | [r]461 | [r]453 | [r]914 | 428 | 30,435 |
| 1984 | [r]436 | [r]475 | [r]901 | 435 | 40,125 |
| 1985 | [r]375 | [r]436 | [r]811 | 389 | 35,450 |
| 1986 | [r]342 | [r]471 | [r]813 | 394 | 34,102 |
| 1987 | 347 | 458 | 805 | 403 | 32,096 |

[r]Revised.

[1]All quantities converted to 100% $Na_2SO_4$ basis.

[2]Current Industrial Reports, Inorganic Chemicals, Bureau of the Census. Revisions for 1983-85 from 1986 Annual, M28A. p. 6.

[3]Includes Glauber's salt.

[4]Data may not add to totals shown because of independent rounding.

Table 4.—Estimated consumption of soda ash in the United States, by end use

(Thousand short tons)

| End use | 1986 | 1987 |
|---|---|---|
| Glass: | | |
| Bottle and container | 2,150 | 2,100 |
| Flat | 750 | 725 |
| Fiber | 300 | 325 |
| Other | 275 | 275 |
| Total | 3,475 | 3,425 |
| Chemicals | 1,300 | 1,450 |
| Soaps and detergents | 620 | 625 |
| Pulp and paper | 300 | 290 |
| Water treatment | 250 | 280 |
| Flue gas desulfurization | 200 | 300 |
| Other[1] | 615 | 660 |
| Total | 3,115 | 3,425 |
| Grand total | 6,590 | 6,853 |

[1]Includes soda ash used in petroleum and metal refining, leather tanning, enamels, etc.

## CONSUMPTION AND USES

Soda ash consumption increased 4% and reversed its downward trend from the previous 3 years.

Beginning in the third quarter, the domestic demand for chemicals increased significantly. High chlorine and caustic soda operating rates created tight supplies, which resulted in an increase in the spot price for these chlor-alkalis. The trend continued and some caustic-soda-based consumers began converting to soda ash on a limited scale by yearend.

The use of soda ash and sodium sulfate in glass manufacture increased slightly, primarily in the fiberglass and specialty glass sectors. Demand for flat glass was down because of the downturn in residential and commercial construction starts. Soda ash consumed in glass container manufacture stabilized despite continued competition from plastic containers.

Liquid detergents represented nearly 40% of the domestic detergent market. Consumer preference for convenience and environmental concerns regarding phosphates continued to reduce the amount of soda ash and sodium sulfate used in detergent formulations. One powdered laundry detergent producer, however, did announce it will change its powder formulation to require more sodium sulfate beginning in 1988.

## STOCKS

**Soda Ash.**—Yearend stocks of dense soda ash in plant silos, warehouses, terminals, and on teamtracks amounted to 289,000 tons, or 12% less than the 1986 yearend inventories. The drawdowns were attributed to higher fourth-quarter sales, which reduced the amount of onhand stocks.

**Sodium Sulfate.**—Inventories of natural sodium sulfate decreased 24%.

## PRICES

**Soda Ash.**—At midyear, a list price increase of $4 per ton and an off-schedule price increase of $6 per ton, both f.o.b. mine or plant, Wyoming, were announced, bringing the list and spot prices up to $87 and $89, respectively. Excess production capacity and strong consumer resistance prevented the producers from achieving the full realization of the price increases. Market prices remained well below these published prices. The average annual value of natural soda ash, f.o.b. Green River, WY, and Searles Valley, CA, was $66.78 per ton.

**Sodium Sulfate.**—Prices of natural and synthetic high-purity sodium sulfate reportedly were at the list levels, ranging from $105 to $115 per ton, depending on location and grade. Saltcake listed at about $60 per ton, f.o.b. plant.[1] The average annual value of bulk natural product, f.o.b. mine or plant, was $86.72 per ton.

**Table 5.—Sodium compounds yearend prices**

| | | 1986 | | 1987 | |
|---|---|---|---|---|---|
| Sodium carbonate (soda ash): | | | | | |
| Light, paper bags, carlots, works | per ton | | $150.00 | | $150.00 |
| Light, bulk, carlots, works | do. | | 123.00 | | 123.00 |
| Dense, paper bags, carlots, works | do. | | 130.00 | | 131.00 |
| Dense, bulk, carlots, works | do. | | 83.00 | | 83.00 |
| Sodium sulfate (100% $Na_2SO_4$): | | | | | |
| Technical detergent, rayon grade, bags, carlots | do. | $90.00- | 95.00 | $90.00- | 95.00 |
| Sodium sulfate, bulk, carlots, works[1] | do. | 113.00- | 114.00 | 113.00- | 114.00 |
| Domestic salt cake, bulk, works[1] | do. | 85.00- | 98.00 | 85.00- | 98.00 |
| National Formulary (NF XII), drums | per pound | | .235 | | .235 |

[1]East of Mississippi River.

Sources: Chemical Marketing Reporter, Current Prices of Chemicals and Related Materials, v. 230, No. 26, Dec. 29, 1986, p. 51; and v. 232, No. 26, Dec. 28, 1987, p. 35.

## FOREIGN TRADE

**Soda Ash.**—Bureau of the Census data for exports to Canada were under reported, according to industry sources. With the cooperation of Statistics Canada, International Trade Division, total exports were adjusted by the Bureau of Mines.

Although China continued to be the largest importer of U.S. soda ash, its share of imports decreased from 32% in 1986 to 23% in 1987. The decline was attributed to reduced soda ash consumption because of intentional slowdowns in housing and commercial construction starts, which required significant quantities of flat glass. The construction pace was progressing faster than the seventh 5-year plan stipulated. A surplus of glass containers manufactured the previous year also contributed to fewer glass bottles made and less soda ash consumed in 1987.

Certain countries maintained trade barriers to limit entry of U.S. soda ash. Early in the year, a commitment was obtained from the Japanese to investigate U.S. soda ash access in Japan. At yearend, the Japanese Fair Trade Commission found that although the four Japanese soda ash producers did not violate Japan's antimonopoly act, they did engage in restrictive trade practices.[2]

**Table 6.—U.S. exports of sodium carbonate and sodium sulfate**

(Thousand short tons and thousand dollars)

| Year | Sodium carbonate | | Sodium sulfate | |
|---|---|---|---|---|
| | Quantity | Value[1] | Quantity | Value[1] |
| 1984 | 1,648 | 160,774 | 76 | 9,267 |
| 1985 | [2]1,747 | [2]173,937 | 119 | 11,899 |
| 1986 | [2]2,049 | [2]241,238 | 111 | 10,188 |
| 1987 | [2]2,224 | [2]253,900 | 122 | 10,454 |

[1]Free alongside ship (f.a.s.) value at U.S. port.
[2]Adjusted by the Bureau of Mines to account for discrepancies in data.

Source: Bureau of the Census.

Table 7.—Regional distribution of U.S. soda ash exports in 1987, by customs districts

(Short tons)

| Customs districts | North America | Central America | South America | Caribbean | Europe | Middle East | Africa | Asia | Oceania | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| Atlantic: | | | | | | | | | | |
| Baltimore, MD | --- | --- | 14 | --- | --- | --- | --- | 3 | --- | 17 |
| Charleston, SC | --- | --- | [illegible] | --- | --- | --- | --- | --- | --- | [illegible] |
| Miami, FL | --- | 22 | 5 | 266 | --- | --- | --- | --- | --- | [illegible] |
| New York, NY | --- | 94 | 7,940 | 39 | 13 | 1 | --- | 1,544 | --- | [illegible] |
| Philadelphia, PA | --- | --- | 10 | --- | --- | --- | --- | --- | --- | [illegible] |
| Portland, ME | 296 | --- | --- | --- | --- | --- | --- | --- | --- | [illegible] |
| Gulf: | | | | | | | | | | |
| Galveston, TX | --- | --- | 24 | --- | --- | --- | [illegible] | --- | --- | [illegible] |
| Mobile, AL | --- | 28 | --- | --- | --- | --- | --- | --- | --- | [illegible] |
| New Orleans, LA | --- | 1 | 1,471 | --- | --- | 134 | [illegible] | --- | 24 | [illegible] |
| Port Arthur, TX | --- | 8,726 | [illegible] | 19,697 | 47,725 | --- | [illegible] | --- | --- | [illegible] |
| Tampa, FL | --- | 6 | --- | --- | --- | --- | --- | --- | --- | [illegible] |
| Pacific: | | | | | | | | | | |
| Anchorage, AK | 1,004 | --- | --- | --- | --- | --- | --- | --- | --- | [illegible] |
| Los Angeles, CA | --- | 7,071 | [illegible] | --- | 3 | --- | [illegible] | [illegible] | --- | [illegible] |
| Portland, OR | --- | --- | [illegible] | --- | 66,070 | --- | [illegible] | [illegible] | 19,568 | [illegible] |
| San Diego, CA | 1,003 | --- | --- | --- | --- | --- | --- | --- | --- | [illegible] |
| San Francisco, CA | --- | --- | 3,188 | --- | --- | --- | --- | 6 | --- | [illegible] |
| Seattle, WA | 4,050 | --- | --- | --- | --- | --- | --- | 5 | --- | [illegible] |
| North Central: | | | | | | | | | | |
| Detroit, MI | 102,032 | --- | --- | --- | 9 | --- | --- | --- | --- | [illegible] |
| Duluth, MN | 28 | --- | --- | --- | --- | --- | --- | --- | --- | [illegible] |
| Great Falls, MT | 14,208 | --- | --- | --- | --- | --- | --- | --- | --- | [illegible] |
| Pembina, ND | 14,130 | --- | --- | --- | --- | --- | --- | --- | --- | [illegible] |
| Northeast: | | | | | | | | | | |
| Buffalo, NY | 196 | --- | --- | --- | --- | --- | --- | --- | --- | [illegible] |
| Ogdensburg, NY | 121 | --- | --- | --- | --- | --- | --- | --- | --- | [illegible] |
| St. Albans, VT | 113 | --- | --- | --- | --- | --- | --- | --- | --- | [illegible] |
| Southwest: | | | | | | | | | | |
| El Paso, TX | 72 | --- | --- | --- | --- | --- | --- | --- | --- | [illegible] |
| Laredo, TX | 140,574 | --- | --- | --- | --- | --- | --- | --- | --- | [illegible] |
| Nogales, AZ | 6 | --- | --- | --- | --- | --- | --- | --- | --- | [illegible] |
| Total[1] | [illegible] | 16,967 | [illegible] | 20,014 | 93,818 | 135 | 147,848 | [illegible] | 78,136 | [illegible] |
| Adjusted total | [2]305,426 | 16,967 | [illegible] | 20,014 | 93,818 | 135 | [illegible] | [illegible] | 78,136 | [illegible] |

[1]Bureau of the Census.

[2]Adjusted by the Bureau of Mines to reconcile discrepancies between Bureau of the Census data and Statistics Canada data, which indicate exports were lower to adjust transactions in Canada. The discrepancy probably occurred in the North Central customs districts.

Table 8.—U.S. imports for consumption of sodium sulfate

(Thousand short tons and thousand dollars)

| Year | Crude (salt cake)[1] | | Anhydrous | | Total[2] | |
|---|---|---|---|---|---|---|
| | Quantity | Value[3] | Quantity | Value[3] | Quantity | Value[3] |
| 1984 | 61 | 4,283 | 204 | 16,975 | 265 | 21,193 |
| 1985 | 40 | 2,549 | 155 | 11,943 | 195 | 14,492 |
| 1986 | 22 | 1,865 | 156 | 11,944 | 198 | 13,809 |
| 1986 | 37 | 2,189 | 101 | 8,173 | 139 | [r]10,362 |
| 1987 | | | | | | |

[1]Includes Glauber's salt as follows: 1984—12 tons ($4,397); 1985—none; 1986—38 tons ($9,175); and 1987—366 tons ($38,318).
[2]Customs, insurance, and freight (c.i.f.) value at U.S. port.
[3]Data do not add to total shown because of independent rounding.

Source: Bureau of the Census.

Table 9.—U.S. imports for consumption of sodium carbonate

| | 1986 | | 1987 | |
|---|---|---|---|---|
| | Quantity (short tons) | Value[1] (thousands) | Quantity (short tons) | Value[1] (thousands) |
| Sodium carbonate, calcined | 105,917 | $14,981 | 149,883 | $18,217 |
| Sodium carbonate, hydrated and sesquicarbonate | 48 | 22 | 500 | 139 |
| Total | 105,965 | 15,023 | 150,105 | 18,356 |

[1]Customs, insurance, and freight (c.i.f.) value at U.S. port.

Source: Bureau of the Census.

## WORLD REVIEW

**Botswana.**—Soda Ash Botswana (Pty.) Ltd., a subsidiary of British Petroleum Minerals International, withdrew plans to construct a soda ash refinery in the Makgadikgadi Pan. A South African industrial group, African Explosives and Chemicals Industries, in which Anglo American Corp. and ICI each own a 30% share, decided to continue with the project. The American Natural Soda Ash Corp. protested the project on the grounds that Botswana was a politically risky source of supply and that the soda ash would prove to be more expensive and less pure than U.S. soda ash.[3]

**Egypt.**—A natural sodium sulfate operation was proposed for construction at Lake Qarun near Fayyoum. The project should begin construction by 1989. A synthetic soda ash plant, with an annual capacity of 200,000 tons, was also proposed for construction at El Arish in the Sinai.[4]

**Korea, North.**—Plans were announced to remodel and expand many chemical plants, including the Sunchon synthetic soda ash facility. The goal is to increase soda ash output by 4.5 times in the next 7-year plan.

**Tanzania.**—A plant was constructed at Mikocheni that will use natural sodium carbonate from Lake Natron to produce caustic soda for use by local soap manufacturers, textile mills, and vegetable oil refineries. The project will help offset the level of imports, which had been about 15,000 tons per year of soda ash.[5]

**U.S.S.R.**—Sodium sulfate production resumed from Kara-Bogaz-Gol after an 8-year hiatus due to environmental problems.[6] The facility was reconstructed and modernized, which should reestablish the U.S.S.R. as the largest producer of natural sodium sulfate in the world.

[1]Physical scientist, Branch of Industrial Minerals.
[2]Chemical Marketing Reporter. U.S. May See Aussie Entry in Soda Ash. V. 232, No. 14, Oct. 5, 1987, p. 7.
[3]———. Sodium Sulfate Slump, Some Hope in Sight. V. 232, No. 26, Dec. 28, 1987, pp. 3, 18.
[4]———. Japan Soda Ash Barriers Lower. V. 232, No. 24, Dec. 14, 1987, pp. 3, 11.
[5]Mining Journal (London). Botswana Soda Ash. V. 309, No. 7940, 1987, p. 327.
[6]Mining Annual Review. Egypt. 1987, p. 136.
[7]Industrial Minerals (London). Mineral Notes. No. 244, 1988, p. 63.
[8]Mining Annual Review. U.S.S.R. 1987, p. 464.

Table 10.—Sodium carbonate: World production, by country

(Short tons)

| Country | 1983 | 1984 | 1985 | 1986[p] | 1987[e] |
|---|---|---|---|---|---|
| Albania[e] | 39,900 | 23,100 | 34,200 | 45,000 | 45,000 |
| Australia[e] | 320,000 | 320,000 | 320,000 | 320,000 | 320,000 |
| Austria[e] | 159,000 | 165,000 | 165,000 | [r]165,000 | 165,000 |
| Belgium | 286,841 | 453,727 | 492,164 | 397,000 | 400,000 |
| Brazil[e] | [r]231,495 | 210,000 | 210,000 | 268,000 | 231,000 |
| Bulgaria | 1,400,918 | 1,336,282 | 1,142,695 | [r]1,210,000 | 1,323,000 |
| Canada[e] | 470,000 | 400,000 | 395,000 | 395,000 | 395,000 |
| China[e] | [r]1,976,442 | 2,070,000 | 2,220,000 | 2,310,000 | 2,970,000 |
| Colombia | 139,192 | 142,623 | 124,701 | 124,479 | 128,000 |
| Czechoslovakia | 104,894 | 111,711 | 123,468 | 124,561 | 161,000 |
| Denmark[e] | 130 | 130 | 125 | 125 | 130 |
| Egypt | 47,899 | 58,072 | 64,132 | [r]65,000 | 65,000 |
| France[e] | 1,100,000 | 900,000 | 900,000 | 925,000 | 900,000 |
| German Democratic Republic | 977,740 | 961,036 | 974,142 | 975,544 | 978,000 |
| Germany, Federal Republic of | 1,342,614 | 1,393,551 | 1,556,462 | 1,509,531 | 1,554,000 |
| Greece[e] | 1,100 | 1,100 | 1,100 | 1,100 | 1,100 |
| India | 839,481 | 915,800 | 986,600 | 902,978 | 1,003,000 |
| Italy[e] | 96,000 | 100,000 | 100,000 | 99,000 | 96,000 |
| Japan | 1,218,285 | 1,142,148 | 1,165,251 | 1,125,282 | 1,157,000 |
| Kenya[e] | 213,508 | 243,177 | 251,442 | 251,964 | 275,000 |
| Korea, Republic of | 254,193 | 271,258 | 276,529 | 291,245 | 320,000 |
| Mexico[e] | 428,272 | 461,277 | 494,127 | [r]500,000 | 500,000 |
| Netherlands[e] | 460,000 | 440,000 | 420,000 | 420,000 | 420,000 |
| Pakistan | 113,922 | 131,276 | 139,162 | 144,288 | 145,500 |
| Poland | 909,406 | 1,011,921 | [r]940,000 | [r]940,000 | 990,000 |
| Portugal[e] | 160,000 | 165,000 | 165,000 | 170,000 | 180,000 |
| Romania | 868,630 | 1,005,397 | 921,531 | [r]940,000 | 950,000 |
| Spain[e] | 550,000 | 610,000 | 610,000 | 580,000 | 616,000 |
| Switzerland[e] | 50,000 | 49,000 | 50,000 | 48,000 | 25,000 |
| Taiwan | 168,419 | 118,179 | 123,479 | 147,002 | 170,000 |
| Turkey[e] | 122,000 | 220,000 | 321,000 | 396,000 | 410,000 |
| U.S.S.R.[e] | 3,620,879 | 3,520,678 | 3,418,368 | 3,546,324 | 3,700,000 |
| United Kingdom[e] | 1,430,000 | 1,100,000 | 1,100,000 | 1,100,000 | 1,100,000 |
| United States[e] | 8,467,118 | 8,511,200 | 8,311,000 | 8,488,103 | [r]8,980,744 |
| Yugoslavia | 202,136 | 207,855 | 220,000 | 220,245 | [r]222,188 |
| Total | 28,715,229 | 31,138,796 | 30,666,726 | 31,378,660 | 32,991,494 |

[e]Estimated. [p]Preliminary. [r]Revised.

[1]Table includes data available through May 6, 1988. Synthetic unless otherwise reported.

[2]Reported figure.

[3]Production for sale only; excludes output consumed by producers.

[4]Natural only.

[5]Includes natural and synthetic; in 1985, Mexico produced 280,000 tons of natural soda ash.

[6]Excludes potash for 1985-87.

[7]Includes natural and synthetic.

## Table 11.—Sodium sulfate: World production, by country[1]

(Thousand short tons)

| Country[2] | 1983 | 1984 | 1985 | 1986[p] | 1987[e] |
|---|---|---|---|---|---|
| Natural: | | | | | |
| Argentina | 30 | 38 | 34 | [r]29 | 35 |
| Canada | 509 | 427 | 403 | [r]409 | 413 |
| Chile[3] | 1 | 1 | 1 | [r]1 | 1 |
| Egypt[e] | 2 | 2 | [r]2 | [r]2 | 2 |
| Iran[e] | 19 | 13 | 13 | [r]136 | 136 |
| Mexico[3] | 436 | 456 | 440 | 505 | 496 |
| South Africa, Republic of | 1 | 1 | (4) | 1 | 1 |
| Spain | 346 | 405 | 530 | 497 | 496 |
| Turkey | 63 | 92 | 129 | 161 | 195 |
| U.S.S.R.[e][5] | [r]395 | [r]390 | [r]395 | [r]380 | 400 |
| United States | 423 | 433 | 389 | 396 | [r]552 |
| Total | [r]2,234 | [r]2,359 | 2,317 | 2,527 | 2,527 |
| Synthetic: | | | | | |
| Austria[e] | 61 | 55 | 55 | 61 | 61 |
| Belgium[e] | 276 | 270 | 287 | 292 | 297 |
| Chile[e] | 67 | 63 | 59 | 76 | 72 |
| Finland[e] | 39 | 39 | 39 | 39 | 39 |
| France[e] | 165 | 132 | 136 | 121 | 127 |

See footnotes at end of table.

**Table 11.—Sodium sulfate: World production, by country[1] —Continued**

(Thousand short tons)

| Country[2] | 1983 | 1984 | 1985 | 1986[p] | 1987[e] |
|---|---|---|---|---|---|
| Synthetic —Continued | | | | | |
| German Democratic Republic | 185 | 181 | 190 | 200 | 198 |
| Germany, Federal Republic of | 135 | 141 | 153 | 180 | 182 |
| Greece[e] | 8 | 8 | 8 | 8 | 8 |
| Hungary[e] | 11 | 11 | 11 | r10 | 10 |
| Italy[e] | 90 | 88 | r88 | 83 | 38 |
| Japan | 287 | 307 | 305 | 279 | 287 |
| Netherlands[e] | 55 | 50 | 50 | 50 | 50 |
| Portugal[e] | 62 | 55 | 55 | 57 | 61 |
| Spain[e,3] | 187 | 187 | 165 | 165 | 182 |
| Sweden[e] | 110 | 110 | 110 | 110 | 110 |
| U.S.S.R.[e,4] | r300 | r300 | r300 | r300 | 300 |
| United States[5] | r491 | r466 | 422 | 416 | [4]423 |
| Total | r2,514 | r2,469 | 2,434 | 2,447 | 2,480 |
| Grand total | r4,748 | r4,727 | 4,751 | 4,974 | 5,007 |

[e]Estimated. [p]Preliminary. [r]Revised.

[1]Table includes data available through May 6, 1988.

[2]In addition to the countries listed, China, Norway, Poland, Romania, Switzerland, and the United Kingdom are known to or are assumed to have produced synthetic sodium sulfate, and other unlisted countries may have produced this commodity, output is not reported, and available information is inadequate to make reliable estimates of output levels.

[3]Natural mine output, excluding byproduct output from the nitrate industry, which is reported separately under "Synthetic" in this table.

[4]Reported figure.

[5]Series reflects output reported by Industrias Penoles S.A. de C.V., Mexico's principal producer, plus an additional 24,000 short tons (revised, estimated) by a smaller producer.

[6]Less than 1/2 unit.

[7]Conjectural estimates based on 1975 information on natural sodium sulfate and general economic conditions.

[8]Byproduct of nitrate industry.

[9]Quantities of synthetic sodium sulfate credited to Spain are reported in official sources in a way such as to indicate that they are in addition to the quantities reported as mined (reported in this table under "Natural"), but some duplication may exist.

[10]Derived approximate figures; data presented are the difference between reported total sodium sulfate production (natural and synthetic not differentiated) and reported natural sodium sulfate sold by producers (reported under "Natural" in this table).

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